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THE

RELATION OF THE PATENT LAWS

TO

AMERICAN AGRICULTURE, ARTS, AND INDUSTRIES,

BEING THE

ANNUAL ADDRESS

BEFORE THE

NEW YORK SOCIETY OF PRACTICAL ENGINEERING,

DELIVERED SEPTEMBER 7, 1875,

✓
BY THE PRESIDENT, JAMES A. WHITNEY.

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PRINTED BY ORDER OF THE SOCIETY.

ADDRESS : 212 BROADWAY, NEW YORK CITY.

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THE NEW YORK
SOCIETY OF PRACTICAL ENGINEERING.

(Address: No. 212 Broadway, New York City.)

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JAMES A. WHITNEY.

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THE NEW YORK SOCIETY
OF
PRACTICAL ENGINEERING.

THE third quarterly session for the year 1875 of the NEW YORK SOCIETY OF PRACTICAL ENGINEERING was held in the Cooper Union on the evenings of September 7, 8, 9, and 10. At the first meeting of the series the Annual Address of THE PRESIDENT, JAMES A. WHITNEY, was delivered as follows:

GENTLEMEN:

As this is the initial meeting of the ninth year of our Society, it was at first intended that this annual address should be a retrospect of the progress of engineering since the date of our organization. But the period that has wrought so many changes in the various branches of our profession has brought to the surface new questions affecting us not only as engineers, mechanicians, and scientists, but as citizens interested, like all others, in the progress and development of the agriculture and industries of the country. While, therefore, it is eminently proper that our proceedings should in the main relate to the various departments of the constructive arts, it equally becomes us to give due attention to those matters of public policy by which, as the case may be, those arts are fostered or retarded. Among these are none of more intrinsic importance, or more forcibly urged upon thinkers, than the laws that relate to the grant of letters-patent for inventions. For myself, I believe them to have been the greatest of all agencies in producing the colossal

results embraced in modern arts and applied science. But there are many earnest and honest men who, misunderstanding the nature and effects of patents for useful improvements, are opposed to the system, and whose antagonism has of late been made manifest in unmistakable terms ; for example, in a bill introduced in Congress the last session but one, which, if it had been passed, would have nullified the beneficent jurisprudence of two hundred and fifty years. And on the second day of June last, one of the great political parties of the country, in its convention for the State of Ohio, under the influence of the Granger movement, committed itself to the following plank of its platform :

“ We demand such a revision of the patent laws as will relieve industry from the oppression of monopolies.”

PATENTS FOR INVENTIONS ARE NOT MONOPOLIES.

This resolution assumes at the outset that the patent laws have proved oppressive to industries. If this assumption were correct, there would remain but little to be said. But no arguments are adduced to sustain its correctness, no facts are brought forward to prove its truth ; on the contrary, every principle of ethics and all the teachings of the history of industries for the past two centuries and a half go to show its futility. What is an oppressive monopoly, or, as the old British law-writers expressed it, an odious monopoly ? It is the taking away from the public of something that the public before enjoyed, but from which it has been unjustly debarred. When the King of England granted to certain persons the exclusive privilege to trade in salt, that was an odious monopoly, because it was a right that had previously belonged to the people at large, and of which they had been arbitrarily deprived. When a powerful corporation, by crooked devices, obtains a large share of the public domain, that may be an odious monopoly, for the lands which had once belonged to the people are taken from them without due recompense. But when a person, instead of appropriating what was previously known or used, *creates* new property, then that newly-created property should, by common

consent, belong to him. Now, the law expressly forbids the issue of a patent, except to some one who has actually and truly *created* a new and useful improvement in some art or manufacture. It simply protects the inventor for a limited time in the possession of what, but for him, would have had no existence. The principle is the same as that which protects all property, except that the inventor has less protection than any other person who *creates* it. The farmer levels the forest or breaks the prairie sod, and this originates wealth, and all the profits of that wealth are "his, his heirs, and assigns for ever." The inventor provides new and improved inventions whereby the farmer can hew down the woodland or invert the furrow with one-tenth the labor that it required before, and these inventions are wealth originated by the inventor; but the law protects him and his legal representatives in the profits of that wealth for a period of, at most, seventeen years. It is impossible to trace in this a single element of an odious monopoly, for the inventor takes nothing from the public that it could have had without him. But by a vicious use of this term, mistaken leaders have succeeded in confusing the idea of patent laws with that of hurtful monopolies, and this, too, in the minds of a class that, more than any other, have been, as we shall see, directly benefited by the patent system. When such ideas are held by a portion of the community so intelligent, so energetic, and so powerful as the Western Grangers, it is time that the ethics and practical effects of patent laws were brought sharp and clear into the daylight of vigorous discussion, in order that they may be judged upon their merits. If the law of patents has wronged any class of men; if it has retarded in any way any industry of our people; if it has prevented the full development of the resources of any portion of our country; if it places the poor at the mercy of the rich; if it robs the farmer to heap the coffers of the manufacturer; if it is contrary to any principle of right, or equity, or justice, then let the patent laws sink "deeper than ever plumbmet sounded." But if, as I believe and contend, every grade of society and all classes of men have been benefited by

patent laws ; if the progress of every industry has been accelerated by them ; if our national resources have yielded a hundred or a thousand fold more than would have been possible without them ; if they provide to-day the readiest means whereby a poor man may rise to affluence and position ; if they add to the wealth of the agriculturist even more than to that of the manufacturer ; if they prove to be based upon those eternal principles of justice and equity which form the foundation of all fair dealing, then let us exalt the patent laws as the great agency of industrial advancement. Let us correct their defects, when such appear, with careful and skilful hands, and then, more than ever before, make them an integral and permanent part of our national jurisprudence and public policy.

THE PATENT LAWS WERE THE OUTGROWTH OF LIBERTY.

We must not forget that the patent laws are inwoven with the history of Anglo-Saxon freedom. They first took the form of positive enactments in the famous statute against harmful monopolies, by which English free-men struck down for ever the arbitrary power of the British kings ; and the most bitter enemies of patents in England to this day are the pseudo-aristocrats, of which Sir William Armstrong is the type. In this country the first patents were granted by the colonies to encourage the manufacture of iron, the building of grist-mills, the success of steam navigation, and other useful enterprises needed by the people. And so deeply impressed with their utility were the founders of the Republic that, fresh from the hot contest with kingly prerogative, they incorporated in the Constitution that proviso upon which our patent laws are based. A few years later, when France threw off the feudal tyranny of centuries, it adopted a patent system as among the first-fruits of its liberty ; and in these later days one of the foremost acts of re-united Italy was the establishment of a patent law protecting inventors by a single grant, in all the provinces, from the Alps, on the borders of Lombardy, to the shoals of the Adriatic. A system that met with such favor

from statesmen so strongly imbued with the spirit of freedom can hardly be in itself oppressive. A system that has stood unchanged, save in the refinements of its practice, during more than two hundred and fifty years, and from the single country of Great Britain has been incorporated in the statute law of every civilized land, must have some merit in it—enough, at least, to render it worthy of the most careful study and examination before any attempt, direct or indirect, to impair or destroy it. Let us, then, proceed to consider the patent law—thoroughly and dispassionately—first as to its ethical justice and propriety, then as to its results as an element of national policy, and, finally, as to its effect upon the agricultural interests of the United States.

THE EQUITY OF GRANTING PATENTS FOR INVENTIONS.

The entire system of protecting new inventions by letters-patent is declared by the courts to rest upon the same principles as a contract. The public, acting through its representative, the Government, says to the inventor, “give us new and useful improvements in the useful arts, and we will pay you for them; not in cash down—for we cannot tell the value of an invention until it has been long and thoroughly tried—but by giving you or your legal representative, for a certain specified time, an exclusive chance to make money out of it, provided your invention is really a good one.” This, in simple English, is the sum and substance of the patent law. Acting on this promise, the inventor proceeds to devise some means of saving time or labor in some industrial pursuit, or of adding to the comforts or enjoyments of life, and, having done this, secures a patent for it. If the improvement is of such utility that the public wishes to use it, the inventor will have a market for it, and will make a profit until his patent expires and the public comes into full and entire possession; if, however, the invention is not truly an improvement, or if the inventor does not provide for its sale or introduction, the public will not buy, and the patentee will make nothing. This is the rule, with so few and trifling

exceptions that they call for no serious consideration. Could any system be more plainly founded on substantial justice, both to the inventor who creates and sells, and the public that buys and uses? Could any be better adapted for bringing into existence a constant supply of new and useful improvements without expense or risk of loss to the public? The inventor simply sells to the world what it never possessed before, and the public pays him for it by permitting him to make what he can from it, without let or hindrance, during a certain specified time. The world will not buy unless it can find its own profit in the buying, and thus the patentee cannot profit unless the world be the gainer also.

IF THE PATENTEE DOES NOT ACT IN GOOD FAITH WITH
THE PUBLIC, HIS PATENT IS VOID.

But, I may hear it objected, a patentee may have a patent on what does not really belong to him. This does happen sometimes. But mark how the law steps in to confound the wrongdoer. If an invention has been made known in any printed publication, or has been in public use in this country, before the date of its invention by the patentee; or if the inventor has allowed it to go into public use for more than two years before his application for a patent; or if he has otherwise abandoned it to the public; or if it appear that the alleged is not the actual inventor, then the patent, even if it has been secured by all the formalities of the Patent Office, will fall to the ground—it will not be worth the ink it is printed with. But this is not all: if the patentee does not describe his improvement so that it can be made and put in use or operation from his specification and drawings alone; or if he does not clearly distinguish his improvement from what was previously known; or if he claims more than he has really invented; or if his invention does not operate successfully, his patent is so much waste paper.

But neither is this all: if the inventor, although he has made a broad invention, claims only a portion of it in his patent, the law holds him to his narrow claim, and he cannot

go beyond it so long as his patent remains in that condition. So, in like manner, if he fails in any of the minute regulations prescribed in making his application, the law compels him to rectify the error before it will give him standing and protection. It is only the inventor that has brought a truly new and useful improvement to the full and complete knowledge of the public, and this according to the forms of law, who can hold the reward or remuneration of a patent. And the man who does this is as much entitled to his reward as is any man who by industry, talent, or skill creates wealth which is added to the available resources of the world. I know that I am speaking at some length on elementary principles. But elementary principles are the all-important ones. If it is right and proper, in point of ethics and morality, that inventors should receive patents, it is the strongest of all evidence in favor of the law.

SPENCER AND MILL ON PATENTS.

Even at the risk of taking more time than I intended, I may be permitted to quote from eminent political economists on this branch of the subject in hand. Says Herbert Spencer, in his *Social Statics* : "They fall into a serious error who suppose that the exclusive right assumed by a discoverer is something taken from the public. He who in any way increases the powers of production is seen by all, save an insane Luddite, to be a general benefactor, who *gives* rather than *takes*. The successful inventor makes a further conquest over nature. By him the laws of matter are rendered more subservient to the wants of mankind. He who economizes labor helps to emancipate men from the slavery to the needs of the body; harnesses a new power to the car of human happiness. He cannot, if he would, prevent society from participating largely in his good fortune. Before he can realize any benefit from his new process or apparatus, he must first confer a benefit on his fellow-men—must either offer them a better article at the price usually charged, or the same article at a less price. If he fails to do this, his invention is a dead letter; if he does it, he makes society a partner in the new mine

of wealth he has opened. For all the exertion he has had in subjugating a previously unknown region of nature, he simply asks an extra proportion of the fruits. The rest of mankind unavoidably comes in for the main advantage ; in a short time will have the whole. Meanwhile, they cannot, without injustice, disregard his claims."

And John Stuart Mill, in language equally energetic, enforces the same truth. He says: "The condemnation of monopolies ought not to extend to the patents by which the originator of an improved process is allowed to enjoy for a limited period the exclusive privilege of using his own improvement. This is not making the commodity dear for his benefit, but merely postponing a part of the increased cheapness which the public owes to the inventor, in order to compensate and reward him for the service. That he ought to be both compensated and rewarded for it will not be denied ; and also that, if all were at once allowed to avail themselves of his ingenuity, without having shared the labors or expense which he had to incur in bringing his idea into practical shape, either such expenses and labors would be undergone by nobody except very opulent and very public-spirited persons, or the state must put a value on the service rendered by an inventor, and make him a pecuniary grant. This has been done in some instances, and may be done without inconvenience in cases of very conspicuous public benefit ; but, in general, an exclusive privilege of temporary duration is preferable, because it leaves nothing to any one's discretion ; because the reward conferred by it depends upon the invention being found useful, and the greater the usefulness the greater the reward ; and because it is paid by the very persons to whom the service is rendered—the consumers of the commodity. So decisive, indeed, are those considerations, that if the system of patents were abandoned for that of the rewards by the state, the best shape which these could assume would be a small temporary tax, imposed for the inventor's benefit on all persons making use of the invention. To this, however, or to any other system which

would vest in the state the power of deciding whether an inventor should derive any pecuniary advantage from the public benefit which he confers, the objections are evidently stronger and more fundamental than the strongest that can possibly be urged against patents. And I have seen with real alarm several recent attempts, in quarters carrying some authority, to impugn the principle of patents altogether—attempts which, if practically successful, would enthron[e] free stealing under the prostituted name of free trade, and make the men of brains still more than at present the needy retainers and dependents of the men of money-bags."

I may, without myself trenching upon the domain of politics, remind our Western friends that both Spencer and Mill are among the most ardent and aggressive advocates of free trade—an idea commonly believed to be dear to the Western farmer's heart.

AMERICAN JURISTS ON THE EQUITY OF PATENTS.

Let me venture further quotations, this time from American writers, which illustrate the same truths in different phrase. George Ticknor Curtis says: "A patent for a useful invention is not, under our law or the law of England, a grant of a monopoly in the sense of the old common law. It is the grant by the Government to the author of a new and useful invention of the exclusive right for a term of years of practising that invention. The consideration for which this grant is made by the public is the benefit to society resulting from the invention, which benefit flows from the inventor to the public in two forms: *firstly*, by the immediate practice of the invention under the patent; and, *secondly*, by the practice of the invention, or the opportunity to practice it, which becomes the property of the public on the expiration of the patent. As the exercise of the invention is wholly within the control of him who made it, who may confine his secret entirely within his own breast, it is apparent that his consent to make it known and available to others, and finally to surrender it to the public, becomes

a valuable consideration, for which, upon principles of natural justice, he is entitled to receive compensation in some form from the public to whom that consideration passes." And Chancellor Kent, the great commentator on constitutional law, speaks of patent cases as placed "peculiarly under the patronage and protection of Congress," and as "involving some of the dearest and most valuable rights which society acknowledges and the Constitution itself meant to favor."

So much for the equity of patents to inventors and their legal representatives. The same reasoning that would destroy these rights would destroy the title-deeds of the farmer's homestead, or his right to the exclusive ownership of the profits of his corn-field. The right is founded in natural justice, and, therefore, properly administered, can be productive only of good results.

THE POLICY OR EXPEDIENCY OF PATENTS.

I believe that what is right as a principle is always right as a practice, and the inherent justice of patent laws is in itself evidence of their propriety as an element of national policy. But it is often plausibly reasoned that a principle may be undeniable in the abstract, and yet inexpedient in its practical application; and to meet any such averment that may be made concerning the matter in hand, let us proceed to judge the patent laws from the lower standpoint of expediency, pure and simple—does it pay the public to reward inventors by means of patents, and, if so, why?

The question may be answered *à priori* by reference to one of the commonest and simplest attributes of human nature—that no man will willingly sow that another may reap. Every invention requires experiment to perfect it, outlay of time and money to prepare for its manufacture, business management to bring it properly into the market, and all before any returns can be received. The cost of all this is very great, and it is plain that no man in his right mind would incur it merely that others, as soon as he had overcome all difficulties, might appropriate his plans, profit

by his experience, and, having been at no outlay themselves, undersell him in the market in the very improvement he had made: This is always the result when the inventor is kept from the protection of a patent. The inventor of the collodion process of photography by some means failed to secure a patent on his invention. It proved worth tens of thousands to the profession and hundreds of thousands to the world. The inventor died in beggary and was buried by charity. How many, with such examples before their eyes, would invent, or, inventing, perfect their improvements and give them to the world, if there were no patent laws to assure them of the prospect of remuneration, of a means of escaping the fate of the unfortunate inventor I have just mentioned. To quote again from Herbert Spencer: "Just in so far as the benefits likely to accrue to the inventor are precarious will he be deterred from carrying out his plans. If," thinks he to himself, "others are to enjoy the fruits of these wearisome studies and these numberless experiments, why should I continue them?" These words of the savant are true; and if we can imagine the advantages that should accrue to the inventor not only made precarious, but absolutely destroyed, as they would be by any curtailment of the scope or spirit of the patent laws, inventors would cease to invent, and the wheels of progress would stand still. Switzerland has never had a patent law, and, notwithstanding her population of artisans, has not contributed one great invention to the world in two hundred years; and were it not for improvements appropriated from lands where patent laws exist, her manufactures would be as stereotyped as the manual methods she employs. Holland repealed her patent law, and to this day her ditches and canals are dredged by hand, when our dredging machinery would do it in one-hundredth of the time. Prussia has a patent law that, in its narrowness and injustice, is a disgrace to the brave German name; and her poor people, kept down to the old primitive modes of labor, harness their women with the oxen before the plough, and drive both together in the furrow. Such are some of the results when inventors

cease to invent, as cease they do, and cease they will, when deprived of the protection of patent laws.

EDUCATIONAL EFFECTS OF PATENT LAWS.

We must not forget, moreover, in estimating the advantages of a wise system of encouragement to originators of good improvements, that the faculty of invention, like that of music, or speech, or writing, like the memory or the will, and every other attribute of the human mind, is one that grows strong and apt and clear by exercise. An inventor's first attempts are commonly crude and imperfect, but by constant exercise the inventive faculty is developed, until he is capable of making, almost by intuition, improvements that would require months and years of labor from men not trained to this special branch of intellectual work. Hence there are hundreds and thousands of men in this country who, led on by the promise held out by the granting of patents, have educated themselves to invention, just as thousands of others have been educated to law or medicine. Do away with patent laws, and this education of men to the special work of improving arts and industries would cease, just as the education of men for the other professions I have mentioned would cease if lawyers and doctors were not paid for their services ; just as modern agriculture would come to an end if the farmer should be taught that the law would refuse to protect his right to the product of his labor and skill ; just as the literature of the age would dwindle down and become slavish and mean, if there were no copyright laws to protect authors in the sale of what they have written.

PATENTS CAUSE INVENTIONS TO BE TRIED, AND ADVERTISED TO THE PUBLIC.

But this is not all. After an invention has been completely elaborated in the brain of its originator ; after it has been fully explained in his specification and drawings ; and after his patent has been secured, the work of the inventor has only fairly begun. The improvement must be reduced to practice ; the best form and proportions, the fittest

materials, and the most efficient manner of using it must all be arrived at through actual construction and careful experiment. All this costs money, and very frequently a good deal of it, and inventors, at the outset at least, are often poor. Without a patent, no money could be obtained from a new invention; for after the money was spent neither the inventor nor his assistant would have any more right to the improvement than any one else. But armed with his patent, the originator of a valuable improvement can commonly find money and faith to assist him in perfecting the invention and demonstrating its utility to the public. Fulton would never have obtained the means to build the first successful steamboat, and thus to give to our country the glory of the great achievement, if his patent from the State of New York had not induced Chancellor Livingston to join in the enterprise. Professor Morse could never have proved the utility of his telegraph, if he had not had a patent to sell in shares to secure aid. The inventor of the most valuable portions of the Buckeye mower sold four-fifths of his right in order to secure the manufacture and sale of the machine on an extended scale; and if we choose to go further back and outside the examples afforded by our own country, James Watt would never have wrought the modern steam-engine into useful shape, if he had not had a patent to share with Boulton, who furnished the means to carry on the manufacture and to make the merits of the invention known. Nine times out of ten where an improvement is introduced to public use, the capital for manufacturing, advertising, and selling it is obtained from parties other than the inventor upon the credit of the patent, and could not possibly be obtained in any other way. Hence we see that the patent laws afford the sole inducement for the production of valuable improvements in the useful arts; that their direct result is to train a class of men especially for the work of making such improvements; and that they not only cause the improvements to be made, but provide, as a direct effect of their operation, the means by which they are practically developed, fitted for actual use, and introduced to the

notice and consideration of the public. Is it not manifest, then, that, taking human nature as we know it to be, and society organized as it is, expediency, apart from all higher considerations, dictates the grant of letters-patent for inventions, the encouragement and fostering of inventors by means of patent laws? But argument based upon proved facts is stronger even than the strongest of *à priori* reasoning, and in the light of such facts let us proceed to still further consider the subject. And I would here remark that the data I shall have occasion to give is taken from the official records of the Patent Office, most of it filed under oath, and, I believe, worthy of implicit credence.

WHAT SOME PATENTS HAVE DONE FOR THE COMMUNITY AT LARGE.

I do not know that I can select an art or industry that has a more direct bearing upon the interests of all classes than the making of books and newspapers. And what has been the agency of patents in the development of this single art, identified with the intellectual, moral, and material welfare of the entire community? Let us commence with the paper; it was cheapened three cents a pound by the invention of Watt and Burgess in 1854, which consisted in boiling wood pulp in caustic alkali under pressure. As concerns the type, David Bruce, Jr., by machines patented in 1843, reduced the cost full twenty-five per cent.; he used a pump to force the molten type-metal into the moulds to secure a sharp, clean letter on the type, and for the production of some varieties enabled steam-power to be used. Then, as to the printing, the press used by Franklin a little over a century ago gave but one hundred and thirty impressions an hour; but to the year 1847 successive patented improvements brought the capacity of newspaper-printing up to from twenty-five hundred to five thousand impressions per hour, the former of large, the latter of small, newspaper size. This was with the famous Napier double-cylinder press, an English invention. It was believed that with this machine the limit of speed was reached; that if a newspaper's

circulation should exceed twenty thousand copies daily, all the type, presses, and appointments of the printing-office, as well as the force of compositors, pressmen, proof-readers, and others, would have to be doubled. And all this time the public were calling for more newspapers, more books, more periodicals, more printed matter generally. It was at this juncture that Richard M. Hoe produced his great improvements in printing machinery, now so well known. In the year 1861 one of the New York journals printed a daily edition varying from 115,000 to 130,000 copies, and this was printed in four hours and a half. To have done the same work on a Napier press would have required five additional forms of type, each at a cost of one thousand dollars per week, making five thousand dollars per week, or \$260,000 per annum, in type alone in this one newspaper office, to say nothing of the additional presses, room, and workmen that would have been required by the Napier presses. During the fourteen years immediately following the issue of the patent, Hoe sold forty of his great presses, and the gain to the public may be fairly estimated from the instance just given. After papers are printed they must be folded, and this was formerly done by hand. But about the year 1859 Cyrus Chambers began a series of inventions for doing this by machinery, and in 1874 he had brought into use seventy-two of his patent "newsfolders" for folding newspapers. The cost of running these machines was two dollars a day each, and each accomplished the work of five men. The same work by hand cost \$8 75 per day, being a saving of \$6 75 per day for each machine, and these newspaper-folders alone, during the original term of the patent, effected an economy of labor amounting to upwards of one million one hundred and sixty-five thousand dollars. But this, like the improvements in paper-making, in type-found ing, and in printing, extended far beyond the production of newspapers. During the same period the paper-folders for duodecimo publications saved in labor more than \$353,000; for octavos more than \$139,000; for quartos more than \$64,000; and for 32mos more than \$522,000—making from this

one patent alone, in less than fourteen years, a saving of human toil and exertion amounting to more than two million two hundred and forty-three thousand dollars; and this economy is to continue and increase for all time, never to be diminished, but likely to be increased by added improvements called forth by the encouragement of the patent laws.

If now we turn to other patents relating to articles of general use, we find universally the same results. We can all recollect the time when feminine fashion, the reverse of what now obtains, called for immense quantities of tempered flat steel wire for crinolines. At the outset this wire cost three dollars a pound, because in tempering it was necessary to wind the flat wire in volute coils kept apart by interlaced iron wires, the coils being then carefully heated in a furnace, and then plunged into a hardening bath. In August, 1858, Henry Waterman patented a plan of drawing the wire lengthwise from the fire through the hardening liquid, and by this means reduced the cost from three dollars a pound to three cents. As a result, the steel skirt, instead of being the fanciful luxury of the rich, was brought within the reach of the poorest. But, far more than this, the method has been found available, with the same economy, in the manufacture of tempered wire for the manifold purposes of manufactures and engineering. The copper-toed shoe is a well-known example of the economy brought about through patents. The saving to the country is estimated at from six millions to twelve millions of dollars annually. The superintendent of a "Home for Little Wanderers" in Boston certified that it reduced the cost of shoes for the children in the establishment from one thousand dollars a year to four hundred. Patents for improvements relating to shoes for horses are equally instructive. To make horseshoes by hand costs an average of sixteen cents each, without counting the cost of the iron. So far back as 1835 Henry Burden began the invention of horseshoe machinery, and in 1857 patented what is claimed to be the first really successful apparatus—although some of his previously-patented devices

were included in it—and in 1871 sold horseshoes, *iron included*, at four and one-half cents each, the shoes weighing, on an average, one pound each. The absolute benefit to the public cannot be calculated, but the gain to the Government alone during the late war amounted to four millions of dollars. And the same motive that led Henry Burden to his long-continued and finally successful efforts—the reward offered by the patent law—is urging other inventors to still further improvements in the same line at the present time.

THE PROFITS OF PATENTEES.

For the profit from a patent on a real improvement, fairly introduced, is no myth. Watt and Burgess were misled by business associates in the management of their wood pulps for paper, but they received four thousand dollars for their British patent alone. David Bruce was a poor man, and, having no capital of his own, sold his two type-machine patents outright for \$1,890. Richard M. Hoe made two hundred and forty-eight thousand dollars, in fourteen years, from the manufacture of his great presses. I have not a full statement at hand of Cyrus Chambers's receipts from his paper-folding machinery, but he received from two of his earlier and minor patents \$6,200 profit. Waterman was more fortunate; for his process of tempering wire brought him, over all expenses, \$83,000 clear. Thomas Silverthorn the inventor of the copper-toed shoe, a poor mechanic, had to wait for his good fortune until his patent was extended, when a company bought it for \$67,000. Henry Burden, during the term of his 1857 patent, made something more than \$900,000 from \$9,000,000 sales of horseshoes; but he employed a very large capital, and, in perfecting his inventions, worked sometimes eighteen hours a day for weeks together.

PROFITS OF PATENTEES COMPARED WITH PROFITS OF THE PUBLIC.

The profits of good patents are, therefore, prizes tempting enough to urge inventors into the most persistent and energetic efforts. But when we compare the benefit to the

inventor with the benefit to the public at large, the former is seen to be but a minute percentage of the latter, even during the lifetime of the patent, while after its expiration the entire invention passes to the public. For instance, previous to S. G. Cornell's improvement in making lead pipe, patented in 1847, the cost of lead pipe was one and one-half cents per pound over and above the cost of the pig-lead; but this invention reduced the cost of manufacture two-thirds, and since then the price of the pipe has been but half a cent a pound more than that of the pig. In 1861 eighteen millions of pounds of lead pipe were used in the United States, and the saving to the public by this invention was, in that year, \$180,000. The inventor received from it \$14,000. There is now in common use a little staple for fastening the rods to the slats of Venetian blinds, which was patented seventeen years ago. It has corrugated shanks to hold in the wood without clinching, so that it stays in the wood much longer than the older kind, and requires so much less metal in its manufacture that in five years' trade in this country alone five hundred tons of iron wire were saved in their fabrication. Seventy-five tons of these little staples are used in the United States every year. This invention saves the public one hundred thousand dollars every year, and the twenty thousand dollars that Byron Boardman, the inventor, received for it, were not by any means too much. Base-burning stoves are well known to all, and the results of a single patent among many relating to them is worthy of note. From 170,000 to 200,000 of this class of stoves, made according to S. B. Saxton's patent of 1859, were put into use, and their superior utility, as compared with previous base-burners, was shown to be at least a dollar and a half each—a moderate estimate, giving a total of about \$275,000; during the same period the inventor received a profit of just \$22,394 19. In other words, while the inventor was making less than one dollar from his invention, the community was making twelve. About the same ratio is shown by B. F. Sturtevant's patent, also of 1859, for a veneer for shoe-pegs. It had previously been impossible to form a veneer from which

shoe-pegs could be cut so uniform in size as to be used in a pegging-machine. In the course of fourteen years this improvement secured a saving in the manufacture of boots and shoes of not less than three millions of dollars. The inventor, who employed the machine in his business of making "ribbon peg-wood," netted a profit of two hundred and thirty-two thousand dollars from its use. Henry W. Putnam's wire fastening for bottle-stoppers, patented in 1864, was a slight and simple thing sold for a dollar and a half a gross, or a trifle more than a cent apiece. But the labor it saved in the tying of corks in soda-water bottles alone amounted to nine millions of dollars in nine years, estimating the labor at one dollar and twenty-five cents per day. The inventor made twenty thousand dollars from it in the same time. That is to say, while the inventor was making one dollar from the patent, the public was making four hundred and fifty dollars from the invention.

Twenty years ago all cotton bales were bound with ropes, and, as a consequence, in case of fire, the ropes burnt off, the bales burst, and the light masses caught like tinder. It was next to impossible to extinguish a fire in a cotton warehouse or on a vessel laden with cotton. During the past few years nearly the entire crop has been bound with iron, the bands being held by patent ties for holding the ends together. This not only keeps the bales compact and hard, so that they can burn but slowly, but also materially diminishes their bulk for shipping. This adds one dollar to the value of every bale of cotton, equal to a gain to the community of four millions of dollars annually. Among several of these simple but valuable bale-ties is that with the open slot, patented so long ago as 1858 by Frederick Cook, which, up to the year 1871, was used upon one million five hundred thousand bales, showing the value of this invention to the public, up to that date, to have been a million and a half of dollars. Cook received four thousand seven hundred and ninety-five dollars from his patent. In 1859 Richard H. Stewart patented a process of clarifying cane-juice for the manufacture of sugar, treating it with sulphurous gas.

Sugar purified by this method was increased in value one half-cent per pound. The war hindered the introduction of the improvement, but since 1867 it would be difficult to find a planter who has not adopted it. In 1860 the sugar crop of Louisiana was five hundred thousand hogsheads. In 1867 it was only five thousand. In 1872 it had reached eighty thousand. If we take this figure as the average of the past five years, the invention has been worth two millions of dollars to the people of the United States during that period. Stewart received, from the fourteen years of his original patent, forty-four thousand three hundred and fifty dollars; or, in other words, he made from his patent in fourteen years not quite as much as the country made from it in six weeks. When the sugar production of Louisiana shall have reached its former extent, this improvement will add two millions and a half of dollars annually to the wealth produced by that State.

Few or none of us have forgotten the time when it was impossible to remove the chimney of a kerosene lamp while hot, and the personal loss of money, time, and patience inevitably experienced from fractured chimneys. About sixteen years ago Charles M. Cahoon labored for months, made his own tools, borrowed money of friends to get along with, broke down his health, and for two months was in a darkened room under the doctor's care, and finally nearly lost his eyesight from studying the lamp-flame under various conditions, and finally, producing an improved burner in which the chimney could be taken off while hot, secured his patent in February, 1861. Infringers assailed and he defended his rights, for which he had worked so long. Judge Clifford sustained them in the U. S. Circuit Court. At last the infringers agreed to pay him. How much? Just one-half of a cent royalty on each burner. Now, what was the value of this invention? The average life of a kerosene lamp-burner is about three years, and the improvement was shown to save the breakage of at least eight chimneys a year, or twenty-four chimneys for every burner sold. The wholesale price of lamp-chimneys is about six cents. Therefore,

while the invention yielded the public nearly a dollar and a half, the patent yielded the patentee a half of a cent. But this improvement is an apt illustration of the value, both to the public and to the inventor, of what, at a superficial view, appear as little things. Up to January last about ten millions of these burners had been sold, and the aggregate saving to the community was fourteen million four hundred thousand dollars. And this was only the money saving; there was much gain in avoidance of accident and immunity from burning the fingers. The inventor received in royalties sixty thousand dollars. Of late years most housekeepers have become familiar with "alkalies" put up in packages for domestic soap-making. Before 1865 it was found impossible to put up caustic alkalies for market in packages. Wood would swell and soften, and the material leak out and destroy everything with which it came in contact. The alkali would "eat up" tin and solder. But George Thompson patented a plan of putting it up in iron—a little thing to do, but great in its results; for one can of alkali put up in this manner, and costing twenty cents, with five pounds of common "soap grease," will make ten pounds of hard soap at an expense of four cents a pound, but of equal quality with that retailed at ten cents. Upwards of twenty millions of cases of caustic alkali put up in this manner were sold during the term of the original patent, equal to the production of two hundred million pounds of soap. The six cents a pound saved to the public on this quantity make a total saving of twelve millions of dollars to the public. During the same period Thompson received from his British patent \$2,404, and from his American one \$2,000 more. It should be mentioned, however, that in this case large profits were made by the assignees, of which I have no data; but although such would add to the amount received by the owners of the patent, it could not in the least detract from the actual saving that inured to the public.

A like instance is found in the tin can patented by John W. Masury in 1859. Formerly, when a tin can was soldered up, it was a difficult matter to open it. Masury hit upon the

idea of making a portion of the cover of very thin metal, which could be readily cut through with a knife. Ten millions of these cans are made yearly. The Borden Condensed Milk Company use ten thousand each and every working day in the year. The invention is largely used in the paint trade, as it enables paints to be put up in liquid form, ready for use, thereby saving the painters time and trouble in mixing paint. The United States Circuit Court decided the value of this improvement to be not less than three cents for each pound-can; but the inventor granted licenses under the patent for a royalty of one-quarter of a cent per pound-can. That is to say, for every twelve cents the public gained from the invention, the inventor was content to gain one cent. But this is not all. The patent law is no respecter of persons. It says to one man, Invent a good thing, and make money from the patent on it; and when this is done, it says to every one, Invent a still better thing, and make money out of the patent on that. So it has been in the present instance. Mr. Masury's can was a great benefit to the community, and thus it became a source of profit to him. The sight of such success made others emulous, and has thus led them to produce other patent cans which are still better, and consequently of even greater benefit to the public. One of the most beneficent effects of the patent law is, after it has caused a great invention to be made, it does not stop there, but leads to the production of many improvements upon it, the scope and value of the original invention being thus continually enlarged. It was so in a remarkable degree with the sewing-machine; for this great invention owes nine-tenths of its usefulness to scores of supplementary inventions that would never have been made if the patent laws had ceased with the fabrication of the first machines. Many interesting illustrations of this could be given, but I have time to mention but a few. Among these is the tuck-creaser, a simple device, patented fifteen years ago by Henry W. Fuller; and to show the widespread usefulness of such adjunctive improvements, I will mention this somewhat in detail. The invention consisted in creasing or making the cloth in lines

parallel with the line of sewing simultaneously with the operation of the needle, so that the making of one seam provided a guide, perfectly parallel with it, either for folding the fabric or for making the next seam. During the life of the patent fifty thousand of these creasers went into use in manufacturing establishments alone. The creasers were found on an average to last a year, or, to keep on the safe side, two hundred days of actual use. Each creaser would do three hundred yards of tucking per day, and this quantity was often doubled. A fair day's work without the creaser was one hundred yards; making the entire work done by one creaser in a year sixty thousand yards, worth three cents per yard, or a total of eighteen hundred dollars. The cost of the labor, including use of the sewing-machine in which it was used, did not exceed four hundred dollars, leaving a net profit of fourteen hundred dollars. But as one-third of this amount would be obtained by the same expense of labor, we must deduct this proportion, leaving a net profit from each creaser of $\$933\frac{3}{7}\frac{3}{7}$, and showing that in manufacturing establishments alone in the short period of fourteen years there was a saving of human labor—a saving in the work of tired fingers and weary eyes—of forty-six million, six hundred and fifty thousand dollars. But this was not all. One million, two hundred of the creasers were sold to families during the same time, and whatever economy resulted from this greater number must be added to the public benefit conferred by the invention. While the cost of materials, etc., remained the same, this invention reduced the price of the finished article from four cents a yard to two cents. You ask me how much the patentee made from it; I have never learned. He should have made a great deal in return for so much given to the world. And there was the "ruffle," patented in the same year by George B. Arnold, and known in the market as the "magic ruffle." This was a new article, and the patentee devised a new way of producing it. His invention shortened the labor of making such articles twenty-fold, and provided a ruffle more uniform and better in quality than

had previously been made by hand. In its manufacture only three operators were required to do the work of fifty; so that, with twenty dollars' worth of material, ruffles could be made ready for market, at a cost of twenty-three dollars, that otherwise would cost seventy. These inventions were worth to the public two millions of dollars a year. The patents during fourteen years brought in to the owners \$49-976⁹³₁₀₀, as proved from their accounts, to which must be added fifteen thousand dollars received from their foreign patents.

The gimlet-pointed screw invented by Thomas J. Sloan has made the old variety as obsolete as the hammers of the neolithic age. It is impossible to estimate the saving of labor ensured by this slight change from the common wood-screw; for the necessity of first boring a gimlet-hole for the screw, and then tapping in the screw with the hammer before the driver could be applied, has been by it entirely done away with. This inventor secured a number of patents for machinery for making the screws, and the value of these adjunctive patents is illustrated by one of them, granted in 1851. This particular apparatus was simply for taking off the slight burr left by the saw used in cutting the nick or groove in the head of the screw. The production of wood screws at that date was ten thousand gross per day. Two hundred and eighty-eight of these machines were in use in the works of the Eagle Screw Company in Providence, R. I., and in fourteen years—the term of patents at that time—the invention effected a saving of ninety-seven thousand dollars. The double hand-stamps for cancelling stamps and post-marking letters by the same stroke of one hand, patented sixteen years ago, saved the Government in 1866 the salaries of two hundred and fifty-four clerks at from \$700 to \$900 each, or more than two hundred thousand dollars per annum. A slight modification in the manner of joining wrought and cast iron in the manufacture of railings, patented the same year, saved one-fourth of the usual expense of repairs, and during the term of the patent saved seventy thousand dol-

lars to the public by its comparative freedom from corrosion and breakage. The subject-matter of Aiken and Felthousen's patent of twenty-four years ago was the first machine to sew tubular goods, such as shirt-sleeves, boot-legs, etc., and in 1865 it was estimated that fifty thousand sewing-machines, embracing one or the other of the features of this improvement, were in use. No other sewing-machine would do the work. One of these machines would save the labor of eight hands, and the invention added ten dollars to the value of any machine to which it was applied. The curved rest which formed one element of the invention was stated by sworn experts to save the community fifty thousand dollars a year in the manufacture of boots alone. But let me turn again to patents the results of which have reached all over the world. We can all recall the time, not many years ago, when metallic or fixed ammunition was used in fire-arms to only a limited extent; whereas not only for army but for all other fire-arms it is now universally used. It was impossible to manufacture such cartridges, either of good quality or cheap enough to permit their use, until Ethan Allen's patent of 1860 disclosed a method which produced a revolution in fire-arms throughout the civilized world. I quote as follows from a sworn statement of the utility of this invention and the money saved to the public by its use up to the year 1871: "At least six hundred million cartridges have been made on the Allen machine; on these the cost of labor for heading has been about thirty thousand dollars. Had it been possible to do all this by the spinning process previously in use, the cost would have been at least one hundred thousand dollars, and at least ten per cent. of the number would have been spoiled by the spinning. The average value of these shells of all sizes during the lifetime of the patent has been four dollars per thousand: the loss by spinning would have been two hundred and forty thousand dollars." But this is not all. Of the remaining ninety per cent. *fifteen per cent.* would have burst in firing—so great a percentage as to make the adoption of metallic cartridges impossible until this drawback was removed." And how

much did Allen receive during the term of fourteen years? He made, in royalties and from the sale of a machine, thirteen thousand one hundred dollars. He also made a manufacturer's profit of forty cents a thousand on sixty-seven millions of the cartridges sold, not to the Government, but to the general trade, which was little enough in all conscience when we consider the importance of the invention.

Perhaps a greater benefit was conferred upon the country and upon mankind through the patents upon which the manufacture of American Brussels and pile carpeting has been founded. Erastus Bigelow secured his first patent in 1837, and subsequently obtained many others, that of 1847 embracing the features that made the machine an absolute success in weaving carpet by the power loom. This invention created a new branch of industry in this country, and its effect was to reduce the wholesale prices of carpets, during the nine years from 1852 to 1861, from \$2 25 to \$1 80 for Wilton per yard; of Brussels, from \$1 33 to \$1 20; of tapestry velvet, from \$2 11 to \$1 25, and of tapestry Brussels from \$1 42 to 82½ cents. The saving to the public up to March 20, 1861, was, in round numbers, one million three hundred thousand dollars. Bigelow had made, up to the year 1861, \$136,912 74 from these inventions—a tenth part of the amount saved to the public during the same time.

WHAT PATENTS HAVE DONE FOR AGRICULTURE.

There can be no improvement in any industry which does not benefit the agriculturist; for he buys the products of all manufacturing arts, while he sells those that result from tillage or the keeping of flocks and herds. With improvements such as we have just considered, the farmer gains, because the articles he purchases are reduced in price; but there are other inventions which redound more directly to his advantage, because they enable him to produce, at a smaller cost to himself, what he has to sell. This class of improvements embraces all agricultural machinery; and the influence of patent laws in bringing into existence the

means that have revolutionized husbandry in all its branches within less than fifty years is to the full as apparent as in every other class of invention. I need not refer to the history of Eli Whitney's cotton-gin or Jethro Wood's iron plough to show that it was the promise held out by the patent laws that led these men, through manifold trials, the one to open the way of this country to supremacy in the growth of the staple fibre of the world, the other to realize in sober fact the fairy tale of Scandinavian mythology, which told how a metal share added tenfold to the produce of the earth. But in agriculture, as in every other art, advancement has been due not more to the celebrated inventions than to multitudes of smaller ones that, each in its place, have saved time, labor, or the necessity of skill; and the aggregate results of these are astounding. The citation of a few examples will show the correctness of my remark that agriculture owes more than any other industry to the fostering spirit of the patent laws. And as the yield of the harvest begins with the turning of the furrow, perhaps the steel plough is the best illustration I can use in this connection. It was patented in 1864 by Francis F. Smith; and as the experience of this inventor is a fair type of that of inventors generally, I may speak of it at some length to illustrate the fact that no man would be justified, in view of his own interests, in devoting himself to producing new and useful improvements, if there were no patent laws to reward him for so doing.

Smith commenced business in Ohio, thirty-three years ago, as a blacksmith, and started his own shop in 1843. In 1854 he removed to Indiana for the special purpose of making ploughs. Here he had frequent occasion to repair ploughs, and also carefully studied their operation in the field. He sought to make improvements as early as 1850, and made two steel ploughs of sheet steel, by hand, in 1856. At this time his business was worth eight dollars per day. He left this and his shop, and worked for a dollar and a half per day in a plough factory in Momence, Illinois, to master the practice of plough-making, and stayed there a year. In

1859 he made numerous experiments in tempering sheet-steel ploughs, but could not save more than one in three. Momence is on the Kankakee River. On the north the soil is free from sand, on the south sharply sandy and gritty; on the north side a plough would last six to eight years, but on the south a hole would often be cut through the share in ploughing twenty-five acres, and frequently the point and rear end of the land side would be cut away. In 1859 he was laid up by sickness, and learned by reading that steel could be cast to shape, but could get no satisfaction by enquiry until brought, by correspondence, into relations with the Collins Steel Company of Connecticut. He went to Collinsville, and left his affairs in the hands of employees at a loss of one thousand dollars during the trip. The company required that he should give up his business, attend to the making of the cast-steel ploughs, and assign one-half of the patents secured. He moved to Collinsville in autumn of 1860. He sold his shop, stock, and household goods at a loss of eleven hundred dollars, and the expenses of moving and of the former trip were six hundred more.

The first cast-steel plough was made and tried at Collinsville in July, 1860. The first lot, costing about fifteen dollars each, and aggregating a cost of \$22,500, was practically a dead loss; they were sent out untempered, and proved too soft for use, and could not be tempered when the defect was discovered, because "a ledge had been cast on the mould-board which would not permit tempering." Smith "gave all his time, energies, and thought to the development of this plough" up to the seventeenth day of April, 1874. The number made and *sold* by the Collins Company was eighty thousand five hundred and sixty-nine. Smith, up to January 1, 1874, over and above money expended, but without allowing anything for his labor during these years, received about \$55,000. The Collins Company invested not less than two hundred and fifty thousand dollars in the manufacture and introduction of these ploughs; and the ploughs could not have been made at a price low enough to come within the reach of the farmer, neither could

they have been introduced when made, without this large capital to pave the way. Cast-iron ploughs are too soft to wear well in sand and grit; they will not scour in soft prairie or bottom lands. Ploughs made of sheet steel had been tried and been practically abandoned. Sheet-steel ploughs are of flat plates; they do not have greatest thickness at points of greatest wear; the plates tend to constantly renew their former flat form. The parts cannot be made uniform, cannot be readily duplicated or repaired, and will not admit of high temper and hardness; for tempering and hardening warps and twists or cracks and spoils the sheet. All these defects are obviated in the cast-steel plough. The worth to the farmer in increased durability, aside from scouring, estimated by sworn experts at five dollars per plough, over and above common ploughs, after making allowance for difference in the prices at which they were sold—80,500 ploughs, with an increased value of five dollars each—is upwards of four hundred thousand dollars gained by the farmers of the West, while the inventor made less than one-seventh of this amount. It is true that the manufacturers made their profits in addition to this, but their capital was necessary to the development and introduction of the invention; and, as we have seen, one of the most useful attributes of the patent law is that it leads individuals to furnish means to practically construct, test, and introduce improvements that without such aid would languish and die. The patent laws bring the genius of the inventor and the resources of the capitalist together, and both, with the aim of enriching themselves, enrich in a far greater degree the public. I have spoken at some length of the steel plough, because it shows how many and serious are the difficulties to be overcome in perfecting what at first sight may appear a simple invention—difficulties so great that the inventor would have been insane to have attempted to overcome them, had not the patent laws held out the certainty of profit in the event of success. Had there been no patent laws, the idea of a steel plough would have been but a myth. As it was, the inventor was rewarded by a competence for creating an

implement destined to add millions of dollars to the wealth of the country.

But a greater than the steel plough was McCormick's reaper; for his reel and divider made grain-harvesting a success. And no man ever showed more thoroughly that his efforts were due to the gain to be secured to himself by patents. In the extension of these patents it was shown by sworn evidence that in those districts of the West where reapers were introduced, the increase in the production of grain was one hundred per cent.; for the labor of those regions could not harvest by the old methods more than one-half of what the soil was capable of yielding. The work of sowing is one-half easier than that of reaping; so that, if all was sown that could be, one-half of the crop would have had to rot on the ground. On an average each machine cut, during each year of its lifetime of ten years, two hundred acres, or a total of two thousand acres. Hence it was that each machine saved to the user, in labor alone, at least five hundred dollars, besides paying its original cost; and in this way, up to 1859, the saving of labor to the public amounted to thirty-six million six hundred thousand dollars. The gain to the public in the increase of the grain crop, due to the invention, to the same date, was one hundred millions of dollars. McCormick's patents were dated 1834, 1845, and 1847; but up to the year 1859 he had devoted twenty-seven years to his improvements. During this time he paid out one million, eight hundred and sixty-five thousand, two hundred and seventy-eight dollars. His receipts, exclusive of bad debts and costs of collection, were \$2,527,692, leaving him a clear profit of \$662,414. This included both manufacturer's profits and royalties. Was it too much? I think not. This man made half a million for himself from his patents in a quarter of a century. His invention yields ten millions to the country every year, and it will continue to do so as long as seed-time and harvest shall continue to the prairies of the West. But the devices that would cut the upright hollow stalks of grain were unsatisfactory when applied to cutting the more slender and fibrous stems and the

yielding leaves of grass; and the sickle-bar, playing through slots in the guard-fingers closed at both ends, clogged so that no successful machine for cutting grass was made before Eliakim R. Forbush, in 1849, patented his guard-finger with the open slot. This enabled the knives to clean themselves, and effectually avoided clogging. This was applied to various machines that needed nothing more to fit them for cutting grass. The inventor was modest enough to estimate the value of this improvement at two dollars for each machine, although no machine that would successfully cut fine grass had ever been used before. Twelve years ago the number of mowing-machines sold in one season was twenty-five thousand, or a gain to the farming community from this device of fifty thousand dollars annually. Forbush was unfortunate, and, while the public was making this, he derived, during the original term of his patent, just twenty-five dollars and ninety cents per annum.

After machines had been made to reap, and other machines had been made to mow, it still remained to provide a machine that would do both. There were numerous attempts to do this before John H. Manny's patent of 1851, but none had succeeded. Before this two distinct machines were required for the two kinds of work, at a cost of from \$235 to \$270, or an average of \$250 for the two. Manny sold a machine, equally efficient for both kinds of work, for \$135, saving \$115 to the purchase of each of his machines. There were made and sold under this patent of 1851 sixty thousand machines, saving to the farmers in fourteen years, in this matter of first cost alone, six million nine hundred thousand dollars. But this is not all. Manny made the cutter-bars of his machine so readily adjustable that they could be raised or lowered to cut lodged grain, the lodged grain being picked up by the bar, cut, and saved. The loss from lodging has been frequently estimated at several bushels per acre; but at only half a bushel per acre, at eighty cents to the bushel, a machine cutting ten acres a day, the saving amounts to four dollars a day for every day a machine is used. Assuming each machine to be

used only twelve days each year, the saving amounts to forty-eight dollars for each machine per annum. These machines, with usual wear and tear, were found to last eight years—a shorter time than McCormick's, because they mowed as well as reaped. Eight times forty-eight dollars is \$384, and the sixty thousand machines saved in lodged grain alone \$23,040,000. Add to this the saving in first cost of machines, and Manny's inventions saved to the agricultural community in fourteen years within a fraction of thirty millions of dollars. Manny secured no less than thirteen patents, from which he made altogether a trifle more than \$283,000, including his profits as a manufacturer, or less than one per cent. of what the farmers had gained from them during the same time. But Manny's profits, like those of every other inventor, ceased when his patents expired. But the public, with these, as with all other inventions, has their benefits for all time; and the same rule holds good for small inventions. In 1861 Nathan Brand patented a machine for making hoes by rolling instead of forging the plates. This reduced the cost from twelve to nine dollars a dozen; and there are one hundred thousand dozen hoes made and sold annually in the United States. Brand made from it, over and above the expense of his experiments, three thousand six hundred dollars.

I had intended to include in this review the various improvements in horse-rakes, seeding-machines, cultivators, etc., which have added so much to the resources of the agriculturist, and each and all of which prove and illustrate the truth that the patent laws which evoked them have, more than to any other one class of community, been of incalculable benefit to farmers; but the length this address has already reached forbids. It requires, however, but little reflection to perceive that if farmers should be deprived of all the aids that the patent laws have induced inventors to provide, their agriculture would be relegated to the old-fashioned scythe and cradle, the bull-plough, the hand-rake, and the hoe wrought from bar-iron in the village blacksmith's shop. And of all classes, farmers can least afford to

dispense with the system that has nourished and roused to energy and practical effect the inventive genius of our people. Themselves with fortunes based upon mental not less than physical labor, they cannot deny to the inventor the recognition of the grand old maxim of Holy Writ that "the laborer is worthy of his hire."



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